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FIG. 1

FIG. 2
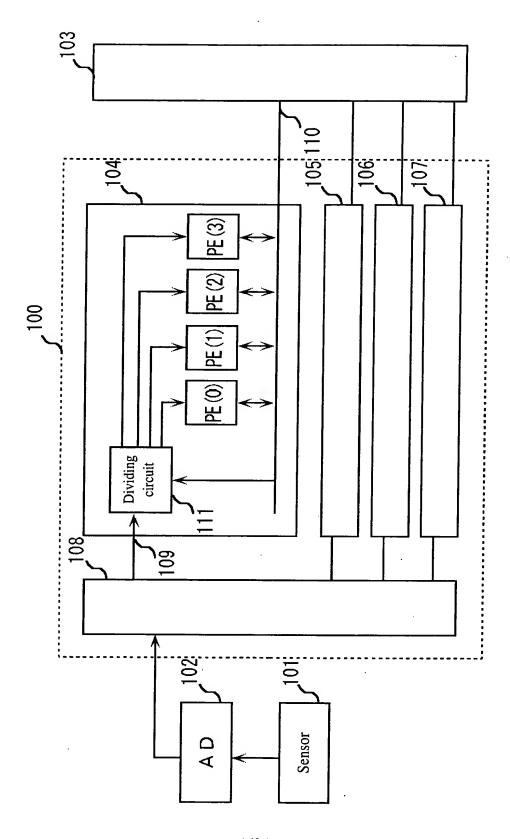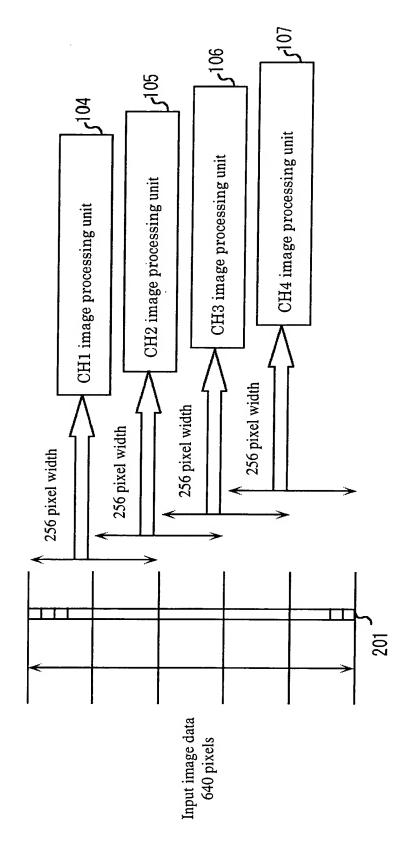
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FIG. 3

Unit image data: Dn+1

OR

Unit image data: Dn

Cutout width: W

OF

Unit image data: Dn-1

Cutout line pointer: LP

302

301

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FIG. 4

Serial image data with 256 pixel width 301

Cutout image data distributed to PEs 302

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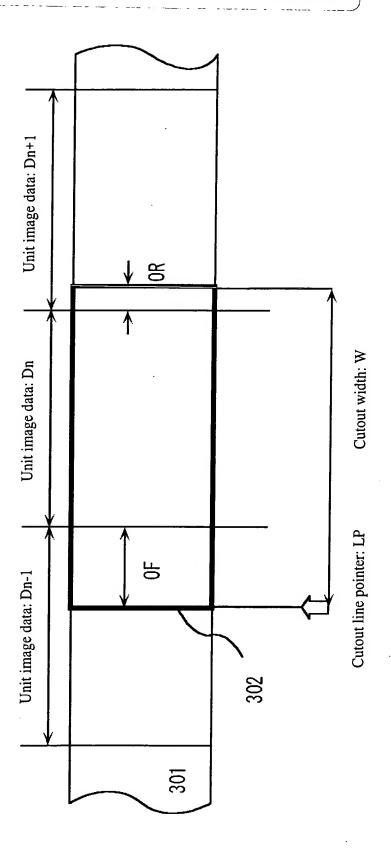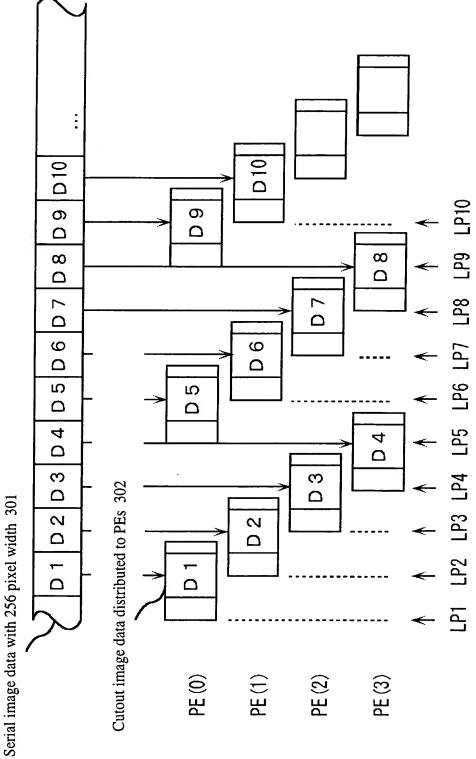Title: IMAGE PROCESSING UNIT FOR WAFER INSPECTION
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FIG. 5

111

110

+1

Line counter

530

Cutout width setting memory

509

501   502   503   504

| LP5 | LP6 | LP7 | LP8 |
| LP1 | LP2 | LP3 | LP4 |

Comparison circuit   Comparison circuit   Comparison circuit   Comparison circuit

505   506   507   508

510   511   512   513

Cutout circuit   520   To PE (0)

Cutout circuit   521   To PE (1)

109

Cutout circuit   522   To PE (2)
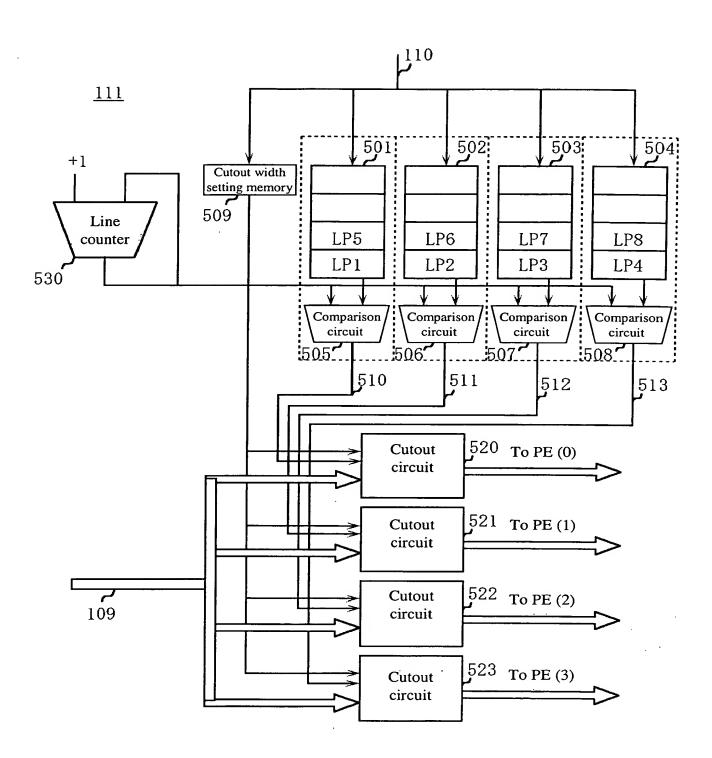
Cutout circuit   523   To PE (3)

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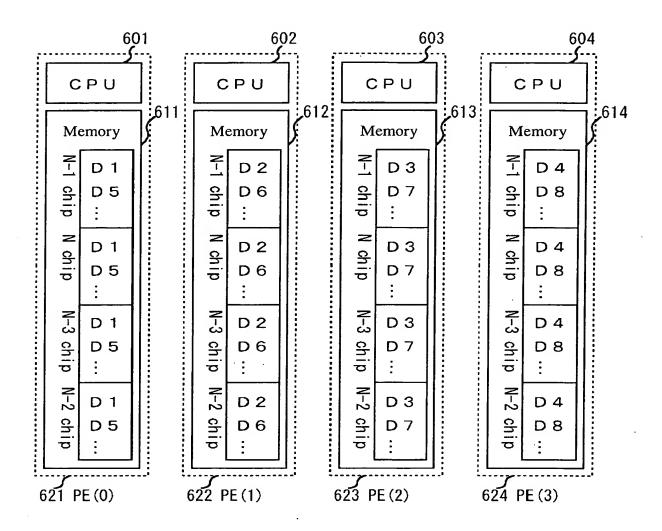Title: IMAGE PROCESSING UNIT FOR WAFER INSPECTION
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FIG. 6

601	602	603	604

CPU	CPU	CPU	CPU

611   612   613   614

| Memory | Memory | Memory | Memory |

N-1 chip N chip N-3 chip N-2 chip

D 1 D 5 ⋮	D 2 D 6 ⋮	D 3 D 7 ⋮	D 4 D 8 ⋮
D 1 D 5 ⋮	D 2 D 6 ⋮	D 3 D 7 ⋮	D 4 D 8 ⋮
D 1 D 5 ⋮	D 2 D 6 ⋮	D 3 D 7 ⋮	D 4 D 8 ⋮
D 1 D 5 ⋮	D 2 D 6 ⋮	D 3 D 7 ⋮	D 4 D 8 ⋮

621 PE (0)   622 PE (1)   623 PE (2)   624 PE (3)

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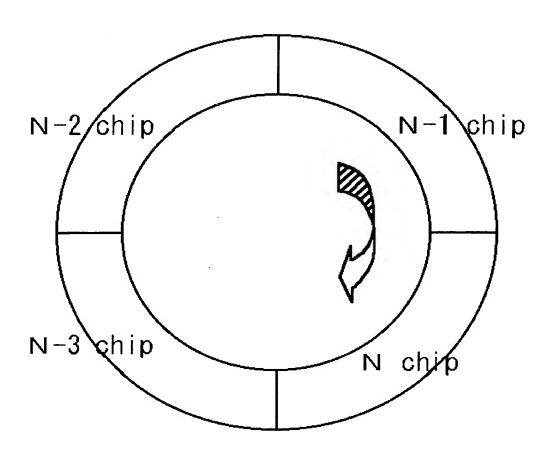Title: IMAGE PROCESSING UNIT FOR WAFER INSPECTION
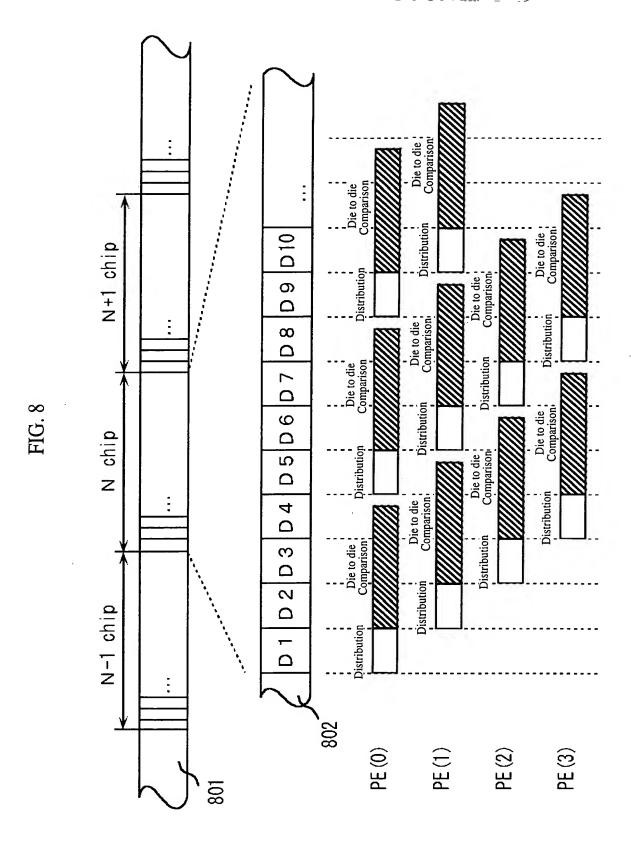 TOOL

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FIG. 7

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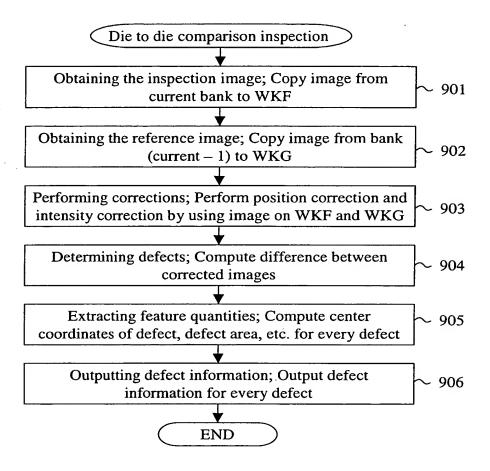 TOOL

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FIG. 8

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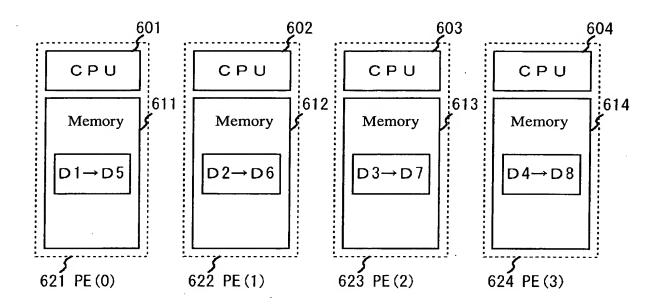   TOOL

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FIG. 9

$$\left(\text{Die to die comparison inspection}\right)$$

| Obtaining the inspection image; Copy image from current bank to WKF | ∼ 901 |

| Obtaining the reference image; Copy image from bank (current − 1) to WKG | ∼ 902 |

| Performing corrections; Perform position correction and intensity correction by using image on WKF and WKG | ∼ 903 |

| Determining defects; Compute difference between corrected images | ∼ 904 |

| Extracting feature quantities; Compute center coordinates of defect, defect area, etc. for every defect | ∼ 905 |

| Outputting defect information; Output defect information for every defect | ∼ 906 |

$$\left(\text{END}\right)$$
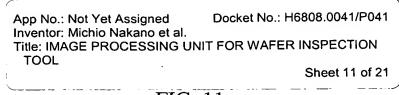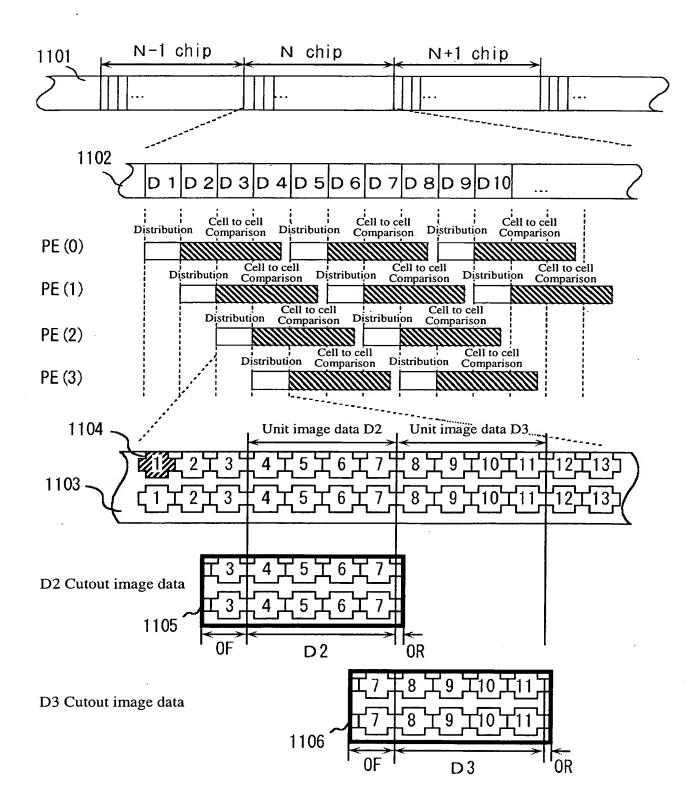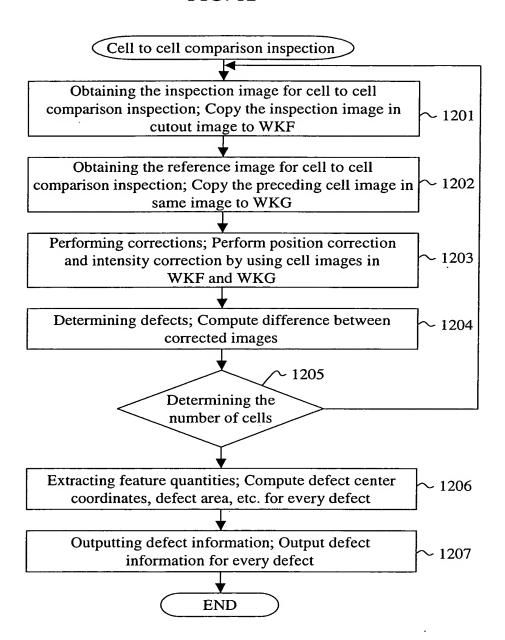
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FIG. 10

| 601 | 602 | 603 | 604 |

| CPU | CPU | CPU | CPU |

| 611 | 612 | 613 | 614 |

| Memory | Memory | Memory | Memory |

| D1→D5 | D2→D6 | D3→D7 | D4→D8 |

621 PE(0)   622 PE(1)   623 PE(2)   624 PE(3)

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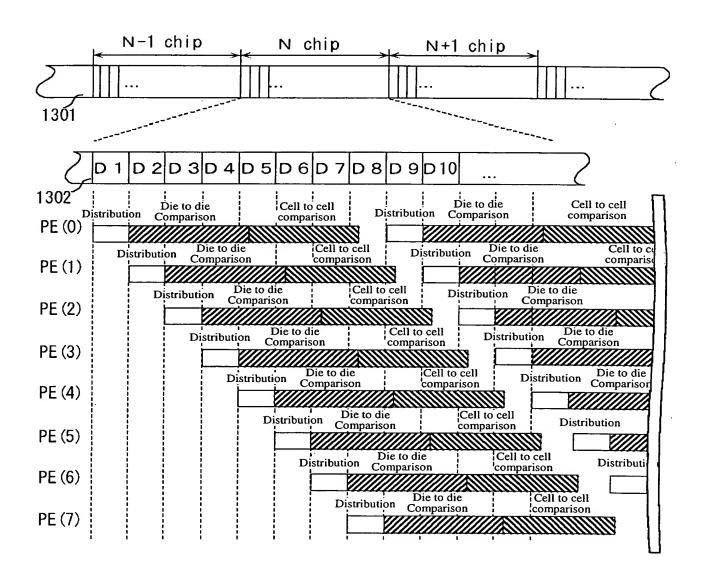FIG. 11

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FIG. 12

(Cell to cell comparison inspection)

| Obtaining the inspection image for cell to cell comparison inspection; Copy the inspection image in cutout image to WKF | ~ 1201 |

| Obtaining the reference image for cell to cell comparison inspection; Copy the preceding cell image in same image to WKG | ~ 1202 |

| Performing corrections; Perform position correction and intensity correction by using cell images in WKF and WKG | ~ 1203 |

| Determining defects; Compute difference between corrected images | ~ 1204 |

~ 1205

< Determining the number of cells >

| Extracting feature quantities; Compute defect center coordinates, defect area, etc. for every defect | ~ 1206 |

| Outputting defect information; Output defect information for every defect | ~ 1207 |

(END)

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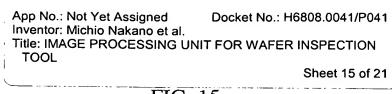   TOOL

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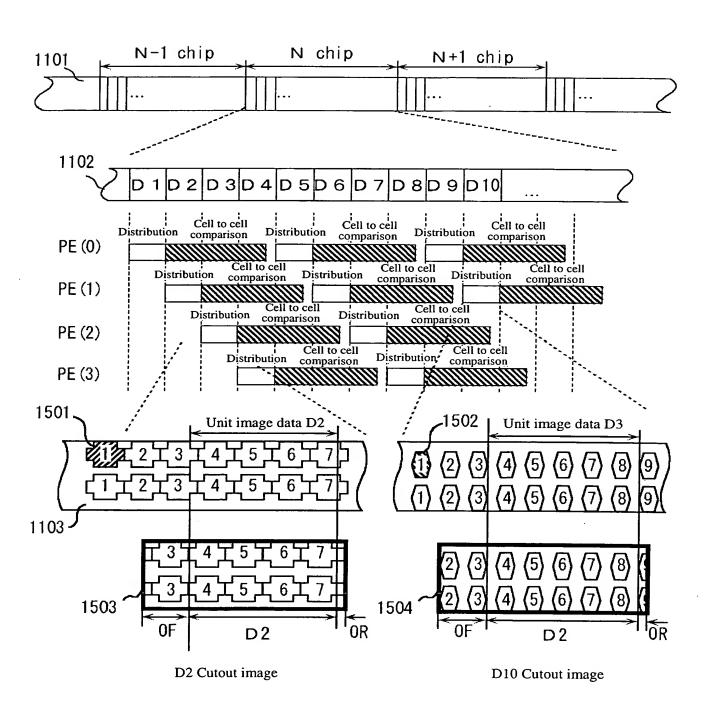FIG. 13

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FIG. 14

Cell-to-cell and die-to-die
hybrid comparison inspection

Obtaining the inspection image; Copy image from current bank to WKF ~1401

Obtaining the reference image; Copy image from Bank (current – 1) to WKG ~1402

Performing corrections; Perform position correction and intensity correction by using image data in WKF and WKG ~1403

Determining defects; Compute difference between corrected images ~1404

Obtaining inspection image; Copy inspection cell region in image data to WKF ~1405

Obtaining the reference image; Copy cell region in same image data to WKG ~1406

Perform corrections; Perform position correction and intensity correction by using cell images in WKF and WKG ~1407

Determining defects; Compute difference between corrected cell images ~1408

Determine the number of cells ~1409

Extracting feature quantities; Compute defect center coordinates, defect area, etc. for every defect ~1410

Outputting defect information; Output defect information for every defect ~1411
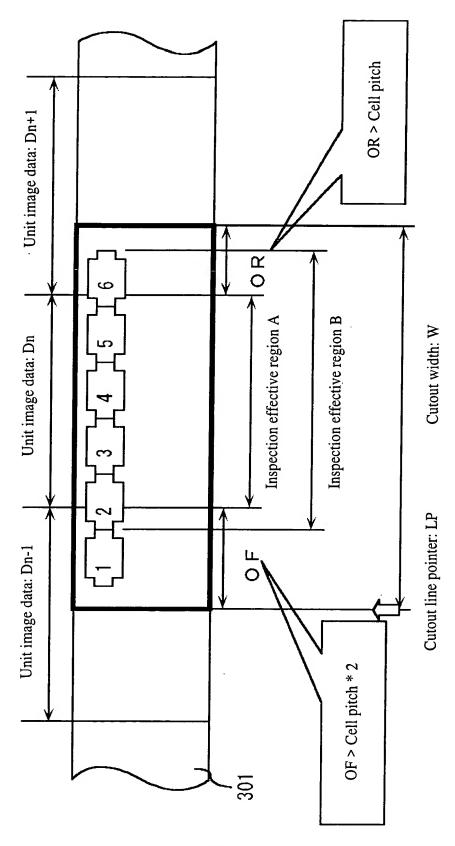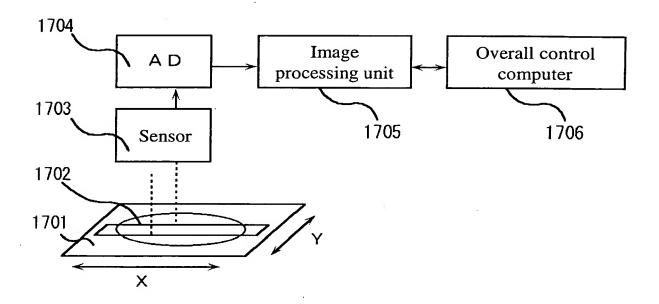
END

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FIG. 15

D2 Cutout image   D10 Cutout image
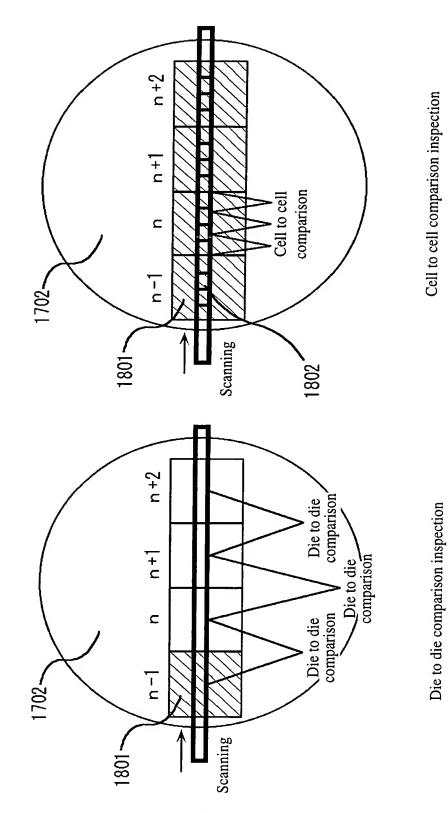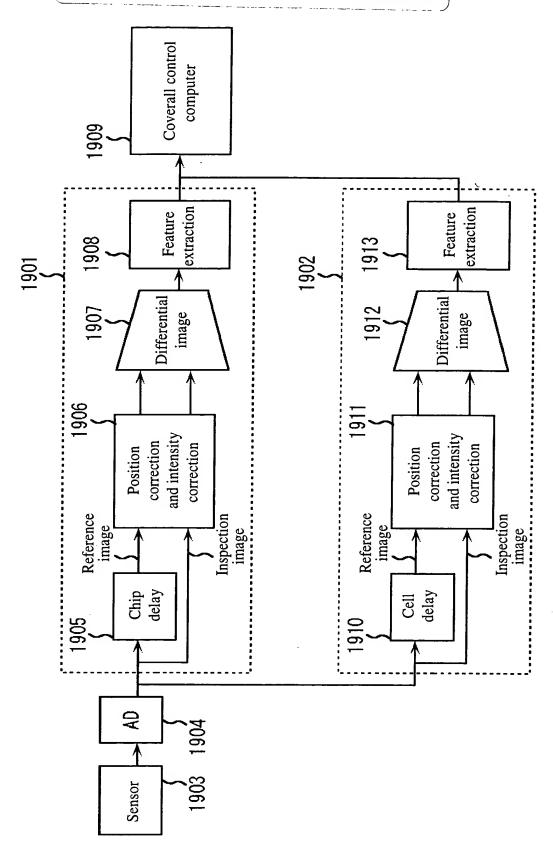
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FIG. 16

FIG. 17

FIG. 18 B

FIG. 18 A

Cell to cell comparison inspection

Die to die comparison inspection

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FIG. 19

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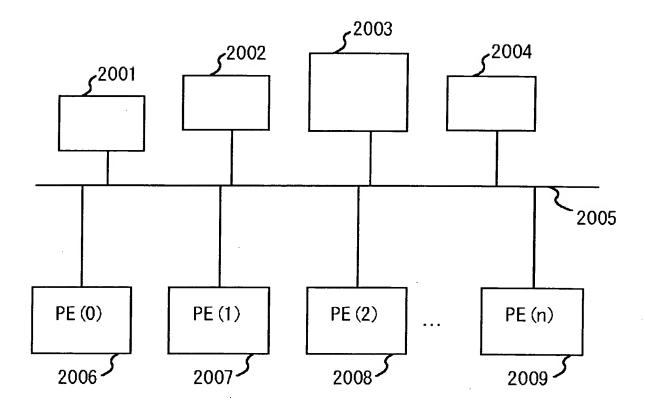
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FIG. 20

2001   2002   2003   2004

2005

| PE (0) | PE (1) | PE (2) | ... | PE (n) |

2006   2007   2008   2009

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